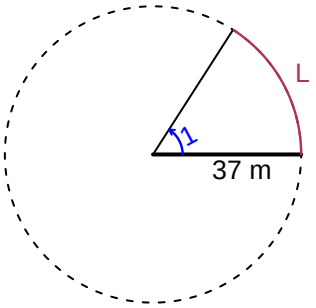
Name: Date:

Trig Final (SLTN v651)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1 radians. The radius is 37 meters. How long is the arc in meters?

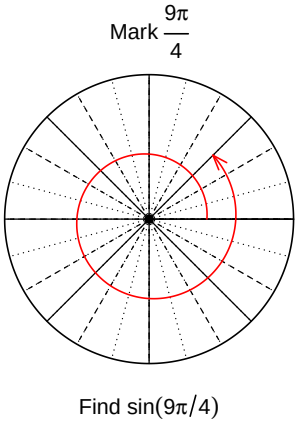


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

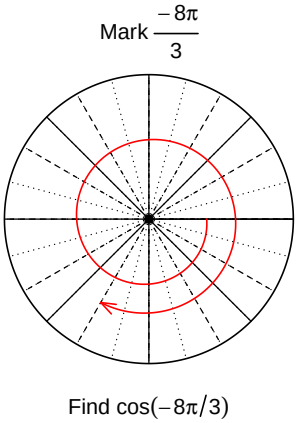
$L = 37$ meters.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-8\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{9\pi}{4}\right)$ and $\cos\left(\frac{-8\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(9\pi/4)$



Find $\cos(-8\pi/3)$

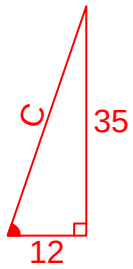
$\sin(9\pi/4) = \frac{\sqrt{2}}{2}$

$\cos(-8\pi/3) = \frac{-1}{2}$

Question 3

If $\tan(\theta) = \frac{-35}{12}$, and θ is in quadrant IV, determine an exact value for $\sin(\theta)$.

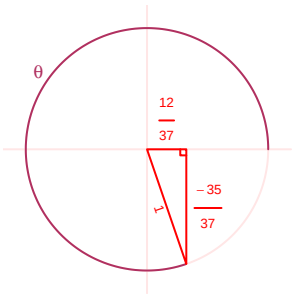
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$12^2 + 35^2 = C^2$$
$$C = \sqrt{12^2 + 35^2}$$
$$C = 37$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\sin(\theta) = \frac{-35}{37}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.37$ meters, a frequency of 3.64 Hz, and an amplitude of 2.37 meters. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.37\sin(2\pi 3.64t) - 5.37$$

or

$$y = 2.37\sin(7.28\pi t) - 5.37$$

or

$$y = 2.37\sin(22.87t) - 5.37$$